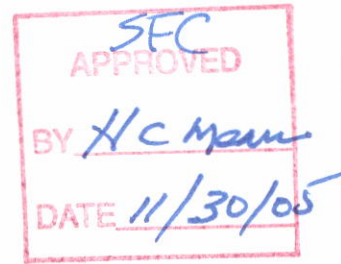


Final Report



A Tagging Study of Atlantic Cod in the Gulf of Maine: Cashes Ledge and Fippennies Ledge and Mt. Desert Island out to Browns Bank

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Gulf of Maine Research Institute (GMRI)
Canada Department of Fisheries and Oceans (DFO)

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Purpose

In 2001, a report entitled *Recommendations for Conducting a Collaborative Cod-Tagging Program for New England and Maritime Canada* (Mooney-Seus 2001) was presented to the National Marine Fisheries Service (NMFS) and the Research Steering Committee of the New England Fishery Management Council. The report was produced by the New England Aquarium (NEA), which had been contracted by NMFS to develop recommendations for how to implement an effective, region-wide cod-tagging program for New England and the neighboring Canadian Maritime area. A broad, federally funded cod-tagging effort had not taken place in U.S. waters since the 1955-59 work of Wise (1963).

Following the NEA report, NMFS issued Cooperative Research Partners Initiative (CRPI) Broad Agency Announcement (BAA) EASC 02-0002 "Atlantic cod (*Gadus morhua*) Tagging Program." In response to the BAA, our collaboration (DMR, GMRI and DFO) submitted a proposal that was accepted by NMFS to conduct cod tagging in the Gulf of Maine (GOM) over a 24-month period beginning in 2003, with the target areas being Cashes Ledge and Fippennies Ledge, and the eastern Gulf of Maine.

The following objectives were listed in the NEA report for the overall project:

- Develop a collaborative cod-tagging program between fishermen and scientists to build bridges and strengthen working relationships towards improved understanding of marine ecosystem functioning
- Improve understanding of current cod distribution and movement patterns throughout the GOM, Georges Bank, Southern New England and coastal waters
- Establish a foundation for future U.S./Canada, industry/scientific community collaborations to enhance understanding of shared marine resources (e.g., tagging programs for other species)

NEA assembled a task force of fishermen and scientists and held a series of eight (8) town meetings in Maine, Rhode Island, Massachusetts and New Hampshire during late 2000 and early 2001 to help define research questions and formulate key design elements of the program. The meetings generated a considerable amount of feedback on how the project should be implemented, including times and geographic locations for tagging, types of tags to be used, ideas for outreach to enhance tag returns, and how the tag return data were to be collected, stored and utilized. The task force recommended that a neutral, non-government entity be established for housing and disseminating data over the short term. Further the report noted that the proposed tagging program would be "the first time that the fishing industry, using industry vessels, will participate as partners in such a broad-scale data collection effort."

The BAA solicited two levels of proposals for cod tagging: Level 1 and Level 2. Our proposal was under Level 1, which was to "address the local tagging infrastructure needed to conduct the actual tagging operations including, but not limited to, recruiting and training fishermen to handle and tag cod while minimizing mortality, initial data gathering and management, and to assist with local outreach efforts including coordination with other local cod tagging efforts and integration of data from these efforts with data from the CRPI initiative when practical." (Level 2 proposals addressed the central coordination/outreach entity). The BAA further clarified the goals and objectives of the cod tagging program as:

- Develop a region-wide collaborative cod tagging program that includes the active participation and involvement of fishermen, scientists and other interested parties
- Improve understanding of cod movement patterns, as well as provide new information on cod essential habitat
- Expand the information base for management of Atlantic cod

For our proposal to tag cod in the GOM, we felt that there was consensus among industry and scientists that understanding of the distribution and movement of cod in the Gulf of Maine, Georges Bank and southern New England regions was not perfectly understood. Further since there had not been a broad-scale tagging effort on cod in U.S. waters since at least 1955-59, there was a possibility that movement patterns described by earlier studies had changed. There had been a steady decline in GOM cod total stock biomass since the 1960's (NEFSC 2001) and distribution of cod (as indicated by NMFS trawl surveys) has been compressed into a smaller area since that time, particularly since 1979-81. Despite the extensive tagging done by Hunt et al. (1999) during 1984-97, primarily in Canadian waters of Browns Bank, northeast Georges Bank, Grand Manan and southwest Nova Scotia, there were still large sections of the Gulf of Maine and Georges Bank for which up-to-date tag recapture data were not available.

The specific objectives of our proposed work were to:

- Develop a collaborative cod tagging program between scientists and fishermen in the Gulf of Maine area, including Canada;
- Obtain and analyze data from tagging recaptures that will enhance our understanding of cod distribution and movement patterns in the Gulf of Maine, and surrounding waters;
- Determine if local substocks or units of cod occupy selected fishing grounds year round in the areas of Cashes Ledge, Fippennies Ledge, and the eastern Gulf of Maine (Mt. Desert Island out to Browns Bank);
- Describe the size and age structure, and reproductive characteristics of cod tagged in these areas;
- Establish a preliminary understanding of cod movements and stock structure that will enable us to develop testable hypothesis for continuing tagging studies.

Approach

In December 2002, each of the organizations which were successful in obtaining funding to participate in the region-wide cod tagging effort began collaborative organizational efforts. The overall project became known as the Northeast Regional Cod Tagging Program (NRCTP). GMRI was designated by NMFS/CRPI as the central coordinating entity and data clearinghouse for NRCTP. Tagging protocol was clearly standardized for all NRCTP partners. Cod were to be tagged using a T-bar anchor tag manufactured by Hallprint Pty (Australia) with the tag inserted proximal to the first dorsal fin using an Avery Dennison tag fastening gun (model #08958).

DMR's strategy was to collect, tag and release at least 20,000 cod in the GOM over a 24 month period, beginning in spring 2003. Our primary target areas were Cashes

and Fippennies Ledges, and the "Downeast" area around Mt. Desert Rock and out to the U.S./Canada border ("Hague Line"). This strategy would effectively cover both major GOM regions designated for cod tagging by the NMFS BAA. Our goal for the number of fish to be tagged was double the number specified by the BAA, based on an expectation of low return rates which was suggested by recent cod tagging studies. Although Hunt et al. (1999) observed an average return rate of 9%, the most recent tagging effort in Canadian waters by Donald Clark (pers. comm.) had yielded returns of only ~2%.

An additional component of this study was tagging to be conducted by DFO, primarily around the outer Bay of Fundy and Browns Bank. Donald Clark (DFO) was successful in tagging around 20,000 cod on the southern Scotian Shelf and Gulf of Maine during 2001-02, and the current study provided an opportunity to augment those efforts. There was also an opportunity to determine the impact of return address on tag return compliance (would Canadian fishermen be any more or less apt to return tags with a U.S. address, and vice versa for U.S. fishermen?). DFO was to deploy 1,000 U.S. (NRCTP) and 1,000 DFO tags in Canadian waters, and DMR was to deploy 1,000 DFO tags in U.S. waters.

Our approach was to contract with commercial vessels which would be used as platforms for tagging operations. GMRI served as vessel management support for this project. In early 2003, GMRI solicited proposals from multispecies permit holders to participate in dedicated cod tagging trips in either Area 1 (Cashes/Fippennies) or Area 2 (Downeast) or both. GMRI and DMR reviewed the proposals and conducted a vessel selection process based on the following criteria, along with point values assigned to each:

- Vessel specifications (25 pts.)
- Rate proposed to charter vessel (25 pts.)
- Experience of vessel captain (20 pts.)
- Experience and commitment of captain and crew to research (20 pts.)
- Experience of vessel owner (10 pts.)

To conduct Area 1 cod tagging in 2003, five (5) vessels were selected from a pool of seventeen (17) applicants. These five were all otter trawl vessels in the 50-70 ft. range. Vessels needed to be capable of conducting multi-day trips in offshore locations, and preferably able to accommodate two (2) scientific personnel, in addition to the captain and typically two (2) vessel crew members. Fishing gear needed to be capable of working in some of the more difficult hard bottom areas of the GOM.

Although some proposals were received from gillnet vessels, our initial evaluation was that the survivability of fish captured using this gear type would not be high enough to warrant its use. Some proposals were also received from various types of commercial and recreational hook vessels for Area 1, but none of these adequately met the criteria.

For the Downeast area (Area 2), a lower number of vessels responded to the RFP than for Area 1. Part of this was due to the very low number of vessels which were active in the groundfishery in Downeast Maine. The Maine groundfish fleet was almost totally consolidated into Portland, closer to Area 1. We had also assumed that our tagging Downeast would be done primarily with one (1) day trips aboard smaller vessels. It became apparent however based on conversations with fishermen that our best success in catching cod Downeast was going to be further offshore than originally planned, in areas such as the Larkin Ridge or the U.S./Canada "gray zone." This would require use of larger, multi-day vessels, which were primarily based in Portland. Additional funding provided by NMFS/CRPI enabled us to increase the number of vessel-days budgeted for Downeast to cover this cost.

A second Downeast RFP based on the additional vessel-days was issued in April 2003. Twenty-one (21) proposals were received and from this six (6) primary vessels and one (1) alternate were selected. Four (4) of these were otter trawl vessels designated to tag in the offshore area. There was also one (1) trawl vessel and one (1) hook vessel chosen to work closer inshore, primarily on day trips. Following review of our application to NMFS Sustainable Fisheries Division, Letters of Acknowledgement (LOA's) were received for each of our vessels to participate in directed cod tagging research trips exempt from any days at sea (DAS) usage, and with no fish to be landed.

Actual tagging began in late April 2003. Protocols used were as described in the NRCTP manual *Standard Protocol for Tagging and Data Collection* (June 2003, updated May 2004). Standard commercial trawl gear with 6.5 inch mesh nets was used in almost all cases. Based on early feedback from some participating fishermen who felt we may be more productive with a smaller mesh, however, on some occasions a mesh size as small as 5.5 in. was used. (This smaller mesh did not seem appreciably more productive, however, and was not used that often. Any changes in mesh size were noted in the haul data.)

Tow durations were normally 20-30 minutes. Haulback was as slow as possible to avoid physiologically detrimental pressure changes as fish were brought up. Nets were emptied either onto the deck and cod were immediately culled and placed in live wells (tanks), or if the catch was almost all cod, nets were sometimes emptied directly into the tanks. Fishing gear was handled by the crew employed by the vessel. Fish tagging and data recording were carried out by the scientific crew on board. Fishermen were able to assist when needed in bringing fish to the measuring area and in recording data if only one tagger was aboard. (Some captains as well became quite proficient in filling out haul logs during the course of the study.)

Procedures for handling, assessing, measuring, tagging and releasing fish, as well as all data recording procedures were as described in the NRCTP manual. All healthy cod of at least 36 cm (preferably 43 cm) total length that we were able to capture were tagged and released.

Two scientific personnel were normally assigned to each tagging trip, which lasted from 1-4 days. Tagging technicians were recruited and trained by GMRI for this study. Scientists from DMR and GMRI also participated as members of the two person tagging crews. In some cases vessel size or life raft capacity limited us to one scientific personnel per trip.

Temperature recorders were also attached to the fishing gear by DMR beginning in 2004 in order to determine temperature at depth where fish were being caught.

Prior to the start of each year a tagging plan, including a monthly schedule was developed. Vessel-days were allocated to the participating vessels based on factors such as their availability and their capability of working offshore vs. inshore. Our objectives in determining times and locations of tagging trips were based on a balance of a.) tagging in our target areas when cod would most likely be present in the highest numbers, and b.) maintaining opportunistic tagging of cod in various GOM nearshore and offshore locations when seasonal aggregations occurred.

Vessel captains were sometimes given specific locations in which to work on a given trip, while on others they were given more discretion based on their knowledge of where to find cod. Fishermen's knowledge was a very large component of this overall project in determining fishing areas. However, since GOM fishermen were not directing effort on cod as much as in the past (due to the significant amount of regulation intended to reduce fishing mortality on the stock) initial attempts to locate cod were sometimes problematic. We also were working in year-round groundfish closures areas (Western GOM, Cashes) meaning no information was available on where cod were being caught.

We utilized NMFS Vessel Trip Report (VTR) data from 1997-2004 for locations and times of cod catches in recent years to help in directing effort. We were also periodically in contact with Massachusetts Division of Marine Fisheries for information on current catches from the GOM Cod Industry-Based Survey.

Annual and other periodic meetings were held with the participating fishermen. The initial meetings were to introduce personnel, review the overall project, and discuss fishing practices, strategies, tagging procedures and administrative issues. Periodic meetings were later held to update fishermen on the project and discuss relevant issues. Industry participants were very involved in project planning and fine-tuning.

During Year 1 (2003), we had structured the project into two geographic sectors (Areas 1 and 2). Each area was managed somewhat separately and had a different tagging coordinator. There were separate allocations of vessel days and a unique charter structure for vessels out of Portland who were tagging in Area 2. Following Year 1, we opted to eliminate the two-area concept and spread management responsibilities more equally over the whole project. One reason was that larger numbers of fish were being caught in the western area, requiring more personnel time and effort. The tagging season was also found to be shorter in the eastern area and therefore resources could be shifted to

the west. Re-alignment also seemed to make the project structure a little clearer to industry participants.

More effort was directed by DMR into the Jeffreys Ledge/Bigelow Bight area in 2004 than in 2003. Since University of New Hampshire researchers had reportedly deployed around 15,000 cod tags in this area in 2001-2002, both we and fellow NRCTP participants had felt that cod tagging efforts in the GOM should be focused on other areas (also following conclusions of NEA report). After Year 1 of the NRCTP effort however collaborators felt that an increased level of tagging (up to 5,000 tags in Year 2) in this area would be appropriate. Much of the GOM cod stock is present in this general area for much of the year and NRCTP coverage of this area was felt to be important to the broader study.

DFO had an opportunistic tagging plan, targeting areas and times of highest cod abundance around the outer Bay of Fundy and outer Passamaquoddy Bay in spring and fall 2003-04. A combination of a DFO research vessel and contracted commercial fishing vessels were used.

Interaction and communication between NRCTP partners was maintained through meetings, phone calls, and e-mails throughout the study. GMRI maintained and coordinated efforts to keep partners apprised of all NRCTP-related developments. Meetings with all partners were held twice per year, and were coordinated by GMRI.

Our outreach plan to promote the cod tagging effort in Maine was aimed at both commercial and recreational sectors. Although we were working with the commercial industry in terms of the actual tagging, we realized that a significant portion (approximately 25%) of cod landings in the GOM is by recreational fishermen. Therefore we wanted to ensure the program was well publicized across all harvesters to enhance tag return rates. Our plan was to establish verbal contact with recreational headboat and charterboat captains and to install posters at commercial fishing establishments, fish piers, lobster dealers, marinas, fuel docks, tackle shops and boat launches. We also wanted to publicize the program through newspaper and industry group publications.

Project Management

Participating vessels and captains

F/V Adventurer (Cameron McLellan)

F/V Elizabeth (Shawn McLellan)

F/V Joann & Holly (David Horner)

F/V Jocka (Steve York, Lendall Alexander, capts., Terry Alexander, owner)

F/V Lady Luck (Leonard Young)

F/V Leslie Ann (Steve Jordan)

F/V Northern Edge (Ellis Batson)

F/V Perseverance (Brian Pushard)

F/V Rachel T (Dale Sparrow, capt., Terry Alexander, owner)

F/V Robert Michael (Curt Rice, capt., Bob Tetrault, owner)

F/V Tara Lynn (Sam Galli, capt., Bob Tetrault, owner)

F/V Theresa & Allyson (Greg Turner, Tim Cook, Billy Train, capts., Allyson Jordan, owner)

F/V Titan (Manley Doughty, capt., Mike Love, owner)

Maine Department of Marine Resources

Susan Haley, cod tagging area coordinator
Kevin Kelly, cod tagging program scientist
Kerrie O'Donnell, cod tagging area coordinator
Amy Winkle, cod tagging area coordinator

Gulf of Maine Research Institute

Pat Foote, NRCTP
Shelly Tallack, NRCTP project manager
Laura Taylor Singer
Sarah Whitford, NRCTP

Cod Tagging Technicians

Sam Beam
Peter Brawn
Curt Brown
Mary Eustace
Julien Gaudette
Drew Gowen
Betsy Grannis
Luke Holden
Phoebe Jekielek
Allyson Jordan

Alicia Leftwich
Graham McKay
Jeni Menendez
Lindsay Routt
Keri Stepanek
Stacey Wahsltrom

Canada Department of Fisheries and Oceans

Donald Clark, biologist
Jennifer Hinze

Findings

DMR was successful in tagging and releasing 23,795 cod in the Gulf of Maine between April 2003 and June 2005. Of this total, 11,652 were tagged in 2003, 8,136 were tagged in 2004 and 4,007 were tagged in April-June 2005 (Table 1). In addition, DFO tagged 6,534 cod as part of this study (4,680 in 2003 and 1,854 in 2004)

The number of vessel-days used (DMR) was 81 in 2003, 84 in 2004 and 17 in 2005 (Table 1). Thus the average number of fish tagged per vessel-day was 144 in 2003, 97 in 2004 and 236 in partial year 2005.

Tagging continued throughout 2003-04 in the Cashes/Fippennies and Downeast Maine areas, but also expanded opportunistically to some more near and midshore GOM locations where cod were located (Figs. 1-2). Our most productive tagging in 2003 was during June 20-27 when 5,026 cod were tagged on the Kettle and Hue 'n' Cry by two vessels (7 vessel-days). A single day (June 25) yielded 1,023 fish tagged (the highest single day for the project). In 2004, our most productive tagging was during June 1-4, in the southern Bigelow Bight, where 1,114 cod were tagged (3 vessel-days). We had our most productive multi-day trip of the project in 2005, when 1,530 fish were tagged (3 vessel-days) on Jeffreys Ledge during May 27-29.

On Cashes/Fippennies, our most productive trip was Sept. 9-13, 2003 when 602 cod were tagged over 4 vessel-days. Two vessels (6 vessel-days) tagged 509 fish on Cashes during May 29-June 1, 2003. Most of our Cashes/Fippennies effort was during spring and early fall. For the western GOM in general tagging was most active during spring and fall. Tagging was suspended during the summer thermocline period to avoid jeopardizing the health and condition of the fish. This was typically from about mid-July to mid-September.

In 2004, Cashes/Fippennies appeared less productive than 2003. It is somewhat more difficult to enumerate productivity of this area for 2004 as several trips that had effort here also fished in other locations over the typically 3-day trips. The most productive trip was probably June 10-13 when 493 cod were tagged over 3 vessel-days on a trip to the Cashes Ledge area, but also to Sagadahoc Ridge and Jeffreys Bank.

For the Downeast area, the most productive trip in 2003 by far was September 9-13 (4 vessel-days) when 1,396 cod were tagged, mostly in the offshore area known as the Corner. In contrast, the most productive trip there in 2004 (Aug. 30-Sept. 3) yielded only 190 cod (4 vessel-days). Most of our effort in the Downeast offshore area was concentrated in late summer-early fall (Downeast tagging was able to continue through the summer as strong tidal mixing prevented a significant thermocline from developing).

The nearshore Downeast area yielded relatively few cod during 2003-04. Our most productive nearshore trip was around Schoodic Ridges on Aug. 14, 2003 with 44 cod tagged. In 2004, only 47 cod were tagged in the nearshore Downeast area over 7 vessel-days. Most effort in this area was during summer.

In an effort to increase catches Downeast in August 2003, a gillnet vessel was used on one trip. Use of a gillnet vessel was not in our original plans, but discussions with fishermen and ex-fishermen prompted us to try a gillnetter as some thought there may be cod present in areas of bottom more amenable to gillnets than trawls. We were not particularly productive however as only 32 cod were tagged over 4 vessel-days Downeast and on Cashes Ledge using this gear. We also used a hook vessel for 3 vessel-days in July 2003 in inshore Downeast areas, with no cod captured or tagged.

Overall our productivity was highly location and time specific. With the exception of the Jeffreys Ledge/southern Bigelow Bight area (not one of the original target areas for tagging) relatively low numbers of cod were often encountered in many parts of the GOM. Trip planning had to center around when we were likely to be productive for a given area. Large numbers of fish could be found, for example, in nearshore areas off Portland (i.e., Tanta Ground, Hue 'n' Cry). There may however have been only a 5-7 day window of opportunity where the fish were aggregated and tagging could be highly productive. Then either the fish were dispersed or water temperatures became too high for tagging. These scenarios sometimes presented logistical challenges with vessel and personnel schedules.

DFO experienced greater success in 2003 than in 2004. A highly productive trip took place in May 2003 in the Bay of Fundy where 3,640 cod were tagged over 5 days. This represented 79% of their total for 2003. In 2003, 22 days of tagging yielded 4,580 cod. In 2004, 1,854 cod were tagged over 15 days in spring and fall. May tagging took place in the Bay of Fundy and October tagging took place near Passamaquoddy Bay and Grand Manan Is. In 2004, only 1,228 cod were tagged in May in the Bay of Fundy.

Size (length) of cod tagged by DMR was slightly greater in 2004 (mean 73 cm) than in 2003 (mean 72 cm) (Figs. 3-6). Size of cod tagged appeared somewhat dependent on area. The size distribution of cod tagged on Jeffreys Ledge was more similar to that of cod tagged from inshore areas than to either cod tagged around Cashes Ledge or Downeast (Figs. 4-5). Mean size of cod tagged was greatest from Downeast (76 cm) and smallest from inshore (69 cm).

DFO tagging presented some contrast in size distribution to DMR. Tagging in the Grand Manan area by DFO in fall 2003 resulted in significantly smaller fish than those tagged by DMR in a nearby portion of the GOM during approximately the same time period (Fig. 7). The size distribution of the 3,640 cod tagged by DFO in the Bay of Fundy during the May 17-21, 2003 tagging trip was distinctly bimodal (Fig. 7).

DMR was successful in tagging many large cod over the course of the project, several fish being at least 130 cm. In fact the largest fish tagged for NRCTP was by DMR on May 10, 2005 on Jeffreys Ledge (134 cm) (see *Appendices*). Spawning fish were also encountered. Aggregations of cod tagged during June-July 2003-05 in Bigelow Bight often contained 15-20% ripe and running fish.

Outreach activities included several ways of publicizing the program to generate positive interest in the fishing community and enhance the rate of tag returns. Commercial fishing establishments such as the Portland Fish Exchange and fish piers in Port Clyde and Rockland were visited frequently to install NRCTP posters, distribute pamphlets and interact with fishermen and fish processing personnel. DMR participated in a seminar on the NRCTP at the Maine Fishermen's Forum in 2004, participating in a panel discussion and displaying a poster. An updated DMR cod tagging poster was also displayed at the 2005 Maine Fishermen's Forum.

Information on the cod tagging program (and installation of NRCTP posters and distribution of pamphlets) was also exchanged at lobster dealers and fuel docks. In order to publicize the program among recreational fishermen, posters were also installed at boat launches, marinas and tackle shops in Maine. The recreational sector was also targeted through direct visits with recreational headboat and charterboat captains in 2003-04 to publicize the program and encourage tag returns. DMR field personnel that were conducting the Marine Recreational Fishing Survey (MRFS) in 2003-04 were also involved with publicizing the program and encouraging fishermen to return tags.

Our project had articles in the *Maine Sunday Telegram* (2003, 2005) and Coastal Conservation Association newsletter (2003) encouraging recreational fishermen to return tags (see *Appendices*). The NOAA National Weather Service office in Gray, ME began a marine weather public service broadcast in early August 2003 alerting fishermen to look for tagged cod (see *Appendices*).

Evaluation

In our opinion, the project successfully met all goals and objectives. In particular, it represented a very productive collaborative effort among members of the groundfish industry and scientists in Maine. Working relationships were strengthened and in many cases were newly established between scientists and vessel captains, crew and owners. Several of the industry participants have expressed interest to us in future collaborative research.

The project was also very successful as a collaborative effort between scientists and fishermen from the U.S. and Canada. A foundation has been established for future U.S./Canada and fisherman/scientist collaborative efforts.

We believe this study will greatly improve understanding of current cod distribution and movement patterns both within the GOM and regionally including the Scotian Shelf, Bay of Fundy, Georges Bank, Southern New England and coastal waters. While some exploratory data analysis is now being conducted by the NRCTP partners, tag returns will likely continue to be collected until some point during 2006-07 before the data will be examined more thoroughly. A benchmark assessment for northeast U.S. cod will be conducted in 2008, and NRCTP partners have determined that it would be appropriate to introduce results from this study to that process. There is a second Northeast U.S. Mark-Recapture Workshop scheduled for 2006 which should provide an ideal venue to begin formulating the tag return data for the stock assessment.

NRCTP partners have determined that results which are based on returns 1-3 years after the fish were released should be considered "short term" and could be subject to interpretive change based on longer term (approx. 5 yr.) results. Appropriate data analysis is likely for each time period. Publication of results is expected to be done both by all partners collaboratively based on the project as a whole, and by individual partners who examine more specific movement questions by area.

Although the number of cod tagged was lower than anticipated in some of the target areas such as Cashes/Fippennies and Downeast Maine, we still considered our work there to be productive. Realizing by the end of Year 1 that these may not be our most abundant areas, we continued to allocate effort there knowing the importance of providing coverage of these areas to our overall understanding of cod movement within the GOM. To our knowledge cod had not been tagged in either of these areas since a relatively small amount of tagging in 1956-57 (Wise 1959). In the end, we feel having information from these areas will prove very beneficial.

Preliminary results from tag returns indicate that Georges Basin should be a target area for follow-up cod tagging. It appears Georges Basin could be a mixing area for western GOM, Georges Bank and Bay of Fundy, but cod have not been tagged there.

Data storage tags could also be used for pulse tagging for further study of spawning aggregations. Conducting this tagging in closed areas may allow the tagged fish to remain at liberty longer and thus provide more information. NRCTP as a whole will have recommendations for follow-up and ancillary studies resulting from the 2003-05 initiative.

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Table 1. Summary of cod tagging effort by ME DMR and Canada DFO, 2003-05.

DMR Cod Tagging Trips – 2003
Western sector (Area 1)

Areas Fished	Vessel Name	Date(s)	# Days	# Cod Tagged	# Recaptures
Platts Bank, Fippennies Ledge	<i>F/V Elizabeth</i>	Apr 24-25	2	57	0
ME-NH nearshore (trawl survey)	<i>F/V Robert Michael</i>	May 5-Jun 6	-	48	0
Jeffreys Ledge	<i>F/V Tara Lynn</i>	May 7-8	2	19	0
Kettle, Platts, Fippennies	<i>F/V Elizabeth</i>	May 19-22	3	360	4
Bigelow Bight - north	<i>F/V Leslie Ann</i>	May 19-22	3	372	3
Cashes Ledge	<i>F/V Titan</i>	May 30-Jun 1	3	264	6
Cashes Ledge	<i>F/V Tara Lynn</i>	May 29-Jun 1	3	245	2
Hue'n'Cry	<i>F/V Titan</i>	Jun 20	1	703	9
Hue'n'Cry	<i>F/V Titan</i>	Jun 21	1	621	19
Hue'n'Cry	<i>F/V Titan</i>	Jun 23	1	911	0
Hue'n'Cry	<i>F/V Titan</i>	Jun 24	1	431	7
Kettle	<i>F/V Elizabeth</i>	Jun 25	1	1,023	1
Kettle	<i>F/V Elizabeth</i>	Jun 26-27	2	1,337	19
Kettle	<i>F/V Elizabeth</i>	Jul 1	1	97	9
Wood Is.	<i>F/V Tara Lynn</i>	Jul 8	1	12	0
Cashes, Fippennies, Platts, Tanta	<i>F/V Leslie Ann</i>	Jul 8-10	3	176	0
Cashes, Fippennies, Platts	<i>F/V Titan</i>	Sep 9-13	4	602	22
Platts, Jeffreys Bank	<i>F/V Titan</i>	Sep 15-17	3	125	4
Platts, Kettle, Tanta	<i>F/V Leslie Ann</i>	Sep 15-17	3	92	1
					3
Fippennies, Cashes, Platts	<i>F/V Elizabeth</i>	Sep 30-Oct 3	3	103	
Cashes, Platts, inshore	<i>F/V Robert Michael</i>	Oct 21-24	3	88	0
Jeffreys Ledge	<i>F/V Elizabeth</i>	Nov 23-26	3	1,337	13
Jeffreys Ledge	<i>F/V Titan</i>	Nov 26	1	193	0
Jeffreys Ledge	<i>F/V Perseverance</i>	Dec 9	1	14	0
Totals			49	9,230	122

DMR Cod Tagging Trips – 2003
Eastern sector (Area 2)

Areas Fished	Vessel Name	Date(s)	# Days	# Cod Tagged	# Recaptures
Larkin Ridge, The Corner, Jeffreys Bank	<i>F/V Adventurer</i>	Jun 9-14	4	137	0
n. of Mt. Desert Rock	<i>F/V Lady Luck</i>	Jul 8	1	0	0
Jeffreys Bank, Matinicus Rock	<i>F/V Jocka</i>	Jul 17-18	1	22	0
inshore, Winter Hbr.	<i>F/V Perseverance</i>	Jul 26	1	0	0
inshore, Winter Hbr.	<i>F/V Perseverance</i>	Jul 28	1	0	0
inshore, Winter Hbr.	<i>F/V Perseverance</i>	Jul 29	1	0	0
e. of Mt. Desert Rock	<i>F/V Lady Luck</i>	Jul 30	1	2	0
n. of Mt. Desert Rock	<i>F/V Lady Luck</i>	Aug 12	1	28	0
Schoodic Ridges	<i>F/V Lady Luck</i>	Aug 14	1	44	0
inshore/offshore Downeast, Cashes Ledge	<i>F/V Rachel T</i>	Aug 18-22	4	32	0
offshore Downeast	<i>F/V Theresa & Allyson</i>	Sep 9-13	4	1,396	23
offshore Downeast	<i>F/V Elizabeth</i>	Sep 22-26	4	328	5
offshore Downeast	<i>F/V Theresa & Allyson</i>	Oct 1-5	4	332	3
Grand Manan, Platts Bank	<i>F/V Adventurer</i>	Oct 13-14, 17-19	4	101	1

Totals 32 2,422 32

DMR Cod Tagging Trips – 2004
All areas

Areas Fished	Vessel Name	Date(s)	# Days	# Cod Tagged	# Recaptures
Jeffreys Ledge	<i>F/V Leslie Ann</i>	Mar 18-20	2	1	0
Jeffreys Ledge	<i>F/V Leslie Ann</i>	Apr 16-19	3	367	2
Jeffreys Ledge	<i>F/V Robert Michael</i>	Apr 20-23	3	283	4
Platts Bank	<i>F/V Perseverance</i>	Apr 30	1	26	0
Jeffreys, Fippennies Ledge, Platts	<i>F/V Titan</i>	May 9-11	2	75	1
Jeffreys, Bigelow Bight	<i>F/V Leslie Ann</i>	May 10-13	3	276	1
Tanta Ground (east)	<i>F/V Leslie Ann</i>	May 24	1	91	1
Bigelow Bight - south	<i>F/V Jocka</i>	June 1-4	3	1,114	11
Tanta Ground	<i>F/V Leslie Ann</i>	June 10-11	1	120	4
Jeffreys Bank, Sagadahoc Ridge, Sigsbees Ridge	<i>F/V Titan</i>	June 10-13	3	493	14
Fippennies, Sigsbees, Three Dory Ridge	<i>F/V Leslie Ann</i>	June 15-16	1	9	0
Jeffreys, Sagadahoc	<i>F/V Titan</i>	June 21-22	2	601	13
Tanta, Hue 'n' Cry, The Ridge	<i>F/V Robert Michael</i>	Jun 22	1	120	4
Tanta, The Ridge	<i>F/V Robert Michael</i>	Jun 24	1	82	0
Jeffreys, Cashes Ledge, Fippennies, Platts, Jeffreys Bank	<i>F/V Adventurer</i>	June 28- July 2	4	392	2
Jeffreys, Hue 'n' Cry, Kettle	<i>F/V Elizabeth</i>	June 29- July 2	3	573	19
Schoodic Ridges	<i>F/V Joann & Holly</i>	July 1	1	6	0
Tanta, Hue 'n' Cry	<i>F/V Elizabeth</i>	July 11-13	2	251	3
The Ridge, Wood Is., Tanta	<i>F/V Leslie Ann</i>	July 15	1	159	2
Schoodic Ridges	<i>F/V Joann & Holly</i>	July 22	1	17	0
Pasture, Tanta, Hue 'n' Cry	<i>F/V Leslie Ann</i>	July 22	1	57	0
Tanta, Scantum Basin, Jeffreys, Kettle, Wood Is., Hue 'n' Cry, Pasture, Edge of the Bottom	<i>F/V Theresa & Allyson</i>	July 29-31	3	257	4
Jeffreys, Tanta, Platts, Fippennies, Sigsbees	<i>F/V Titan</i>	Aug 7-9	3	154	2
The Corner, Larkin Ridge	<i>F/V Elizabeth</i>	Aug 17-20	3	91	0
Schoodic Ridges	<i>F/V Joann & Holly</i>	Aug 19	1	21	0
The Corner	<i>F/V Theresa & Allyson</i>	Aug 30- Sept 3	4	190	1
Schoodic Ridges	<i>F/V Northern Edge</i>	Sept 14-15	2	0	0
The Corner	<i>F/V Titan</i>	Sept 16-19	3	32	0
Sagadahoc, Platts, Doggetts, Tanta	<i>F/V Titan</i>	Sept 21-22	2	137	3
Schoodic Ridges	<i>F/V Northern Edge</i>	Sept 21-22	2	3	0
Sagadahoc Ridge	<i>F/V Leslie Ann</i>	Sept 27-28	2	156	0
Jeffreys Ledge	<i>F/V Adventurer</i>	Sept 27-29	3	305	2
Jeffreys Ledge	<i>F/V Adventurer</i>	Oct 6-8	3	766	25
Sigsbees, Fippennies, Platts	<i>F/V Jocka</i>	Oct 12-15	3	108	5
Fippennies Ledge	<i>F/V Adventurer</i>	Oct 13-14	2	39	0
Platts, Fippennies	<i>F/V Theresa & Allyson</i>	Oct 18-21	3	377	3
Sigsbees Ridge	<i>F/V Adventurer</i>	Nov 10-11	2	26	0
Jeffreys Ledge	<i>F/V Elizabeth</i>	Nov 17-19	3	361	5

Totals 84 8,136 131

DMR Cod Tagging Trips – 2005
All areas

Areas Fished	Vessel Name	Date(s)	# Days	# Cod Tagged	# Recaptures
Jeffreys Ledge	<i>F/V Leslie Ann</i>	Apr 6-7	2	146	3
Jeffreys, Boon Is.	<i>F/V Leslie Ann</i>	Apr 11-12	2	65	0
Scantum Basin, Jeffreys	<i>F/V Jocka</i>	May 10-12	3	844	6
Jeffreys Ledge	<i>F/V Theresa & Allyson</i>	May 27-29	3	1,530	17
Jeffreys Ledge	<i>F/V Elizabeth</i>	June 1-4	3	598	19
The Ridge	<i>F/V Leslie Ann</i>	June 17-18	2	618	6
Ipswich Bay	<i>F/V Northern Edge</i>	June 25-26	2	206	10
Totals			17	4,007	61

DFO Cod Tagging Trips

2003

Areas Fished	Date(s)	# Days	# Cod Tagged
Browns Bank	March 22-27	5	130
Bay of Fundy (Digby scallop grounds)	May 17-21	5	3,640
Grand Manan	Sep 17-18	2	210
Grand Manan	Oct 18-22	5	350
Grand Manan	Nov 3-7	5	350

Totals 22 4,680

2004

Areas Fished	Date(s)	# Days	# Cod Tagged
Bay of Fundy (Yankee Bank, Digby scallop grounds)	May	8	1,228
Wolves (Passamaquoddy Bay), North Head (Grand Manan)	October	7	626

Totals 15 1,854

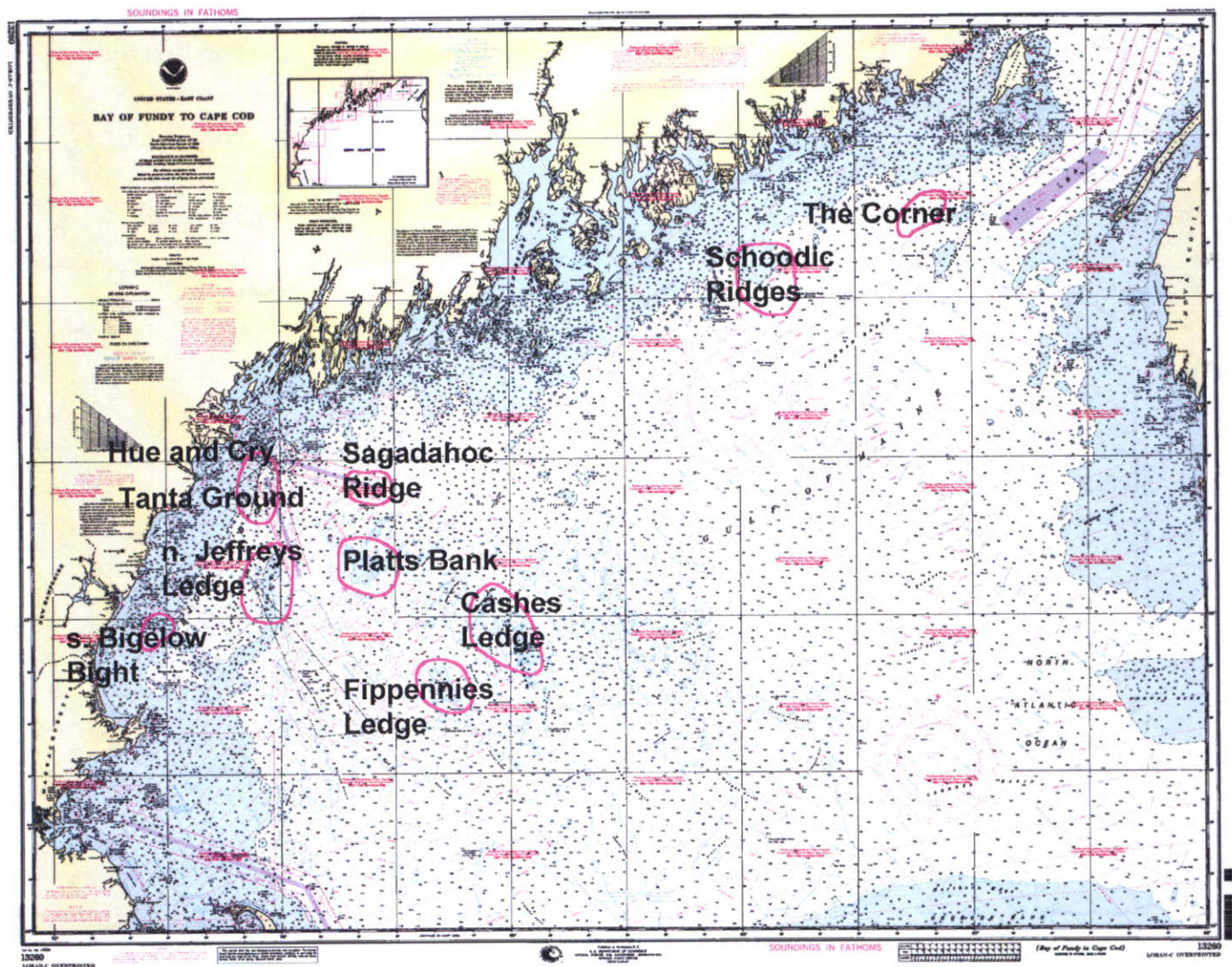


Figure 2. Primary locations of DMR cod tagging, 2004.

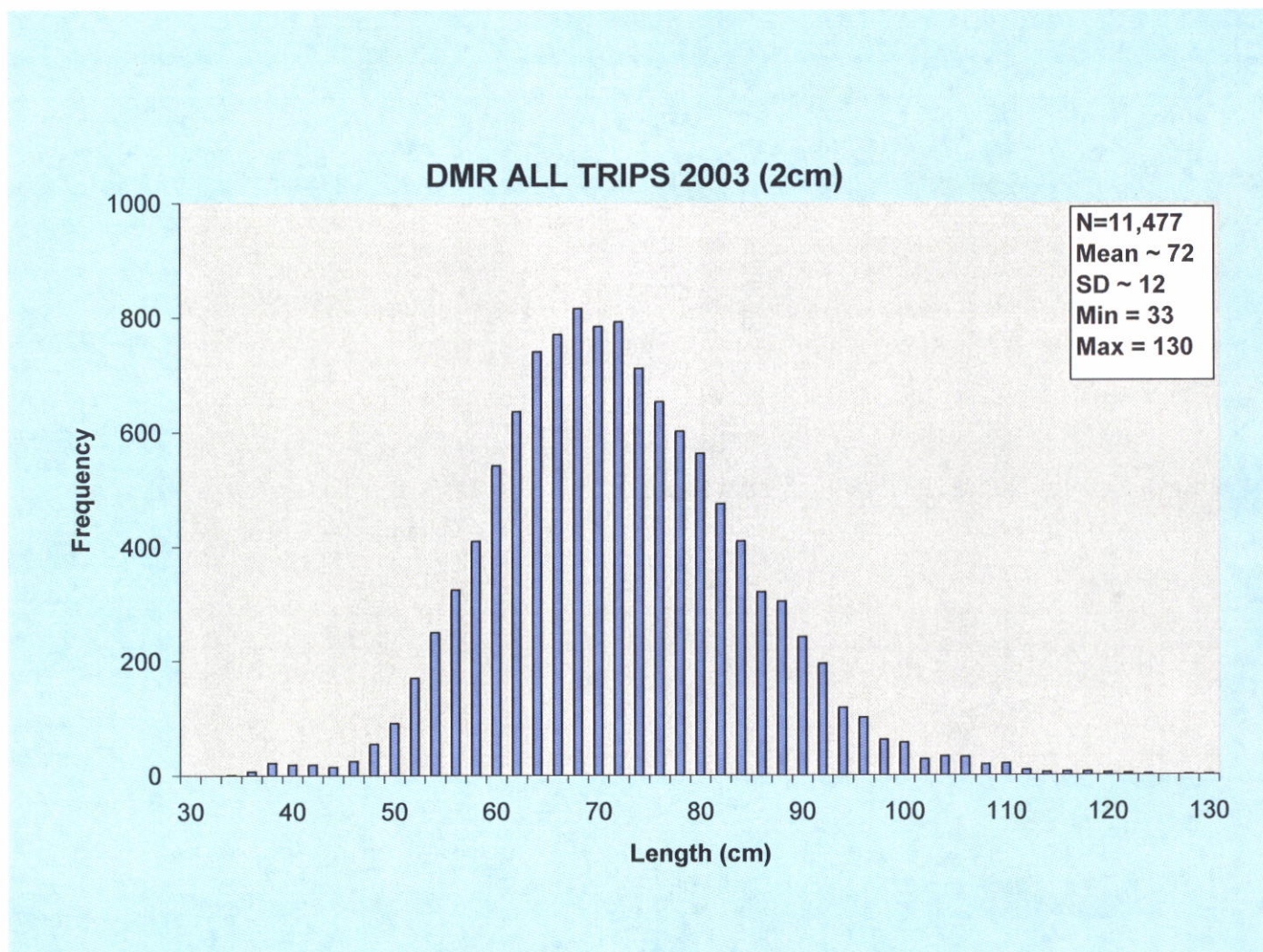


Figure 3. Length frequency of cod tagged and released by DMR, 2003.

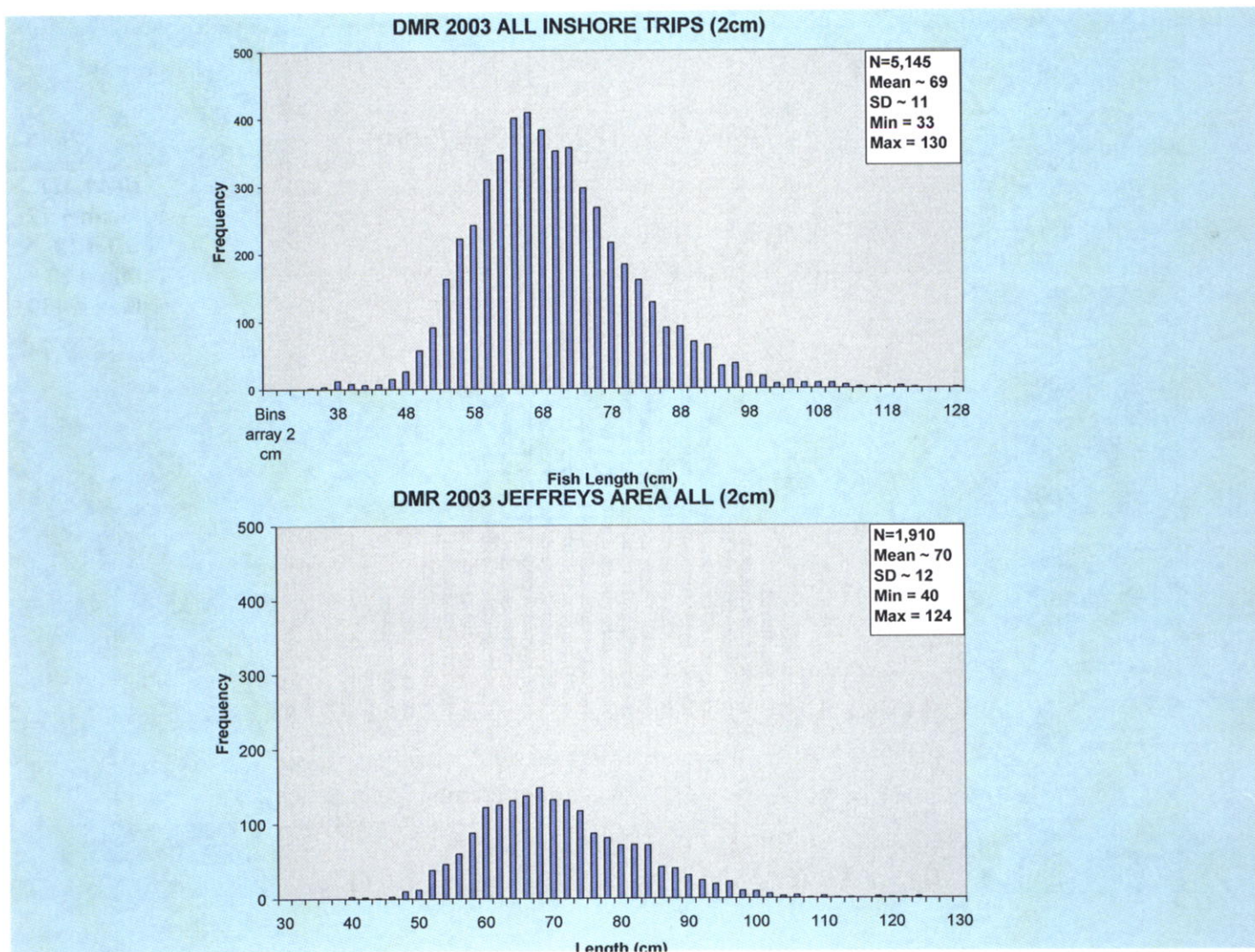


Figure 4. Length frequency of cod tagged and released by DMR in 2003, inshore vs. Jeffreys Ledge.

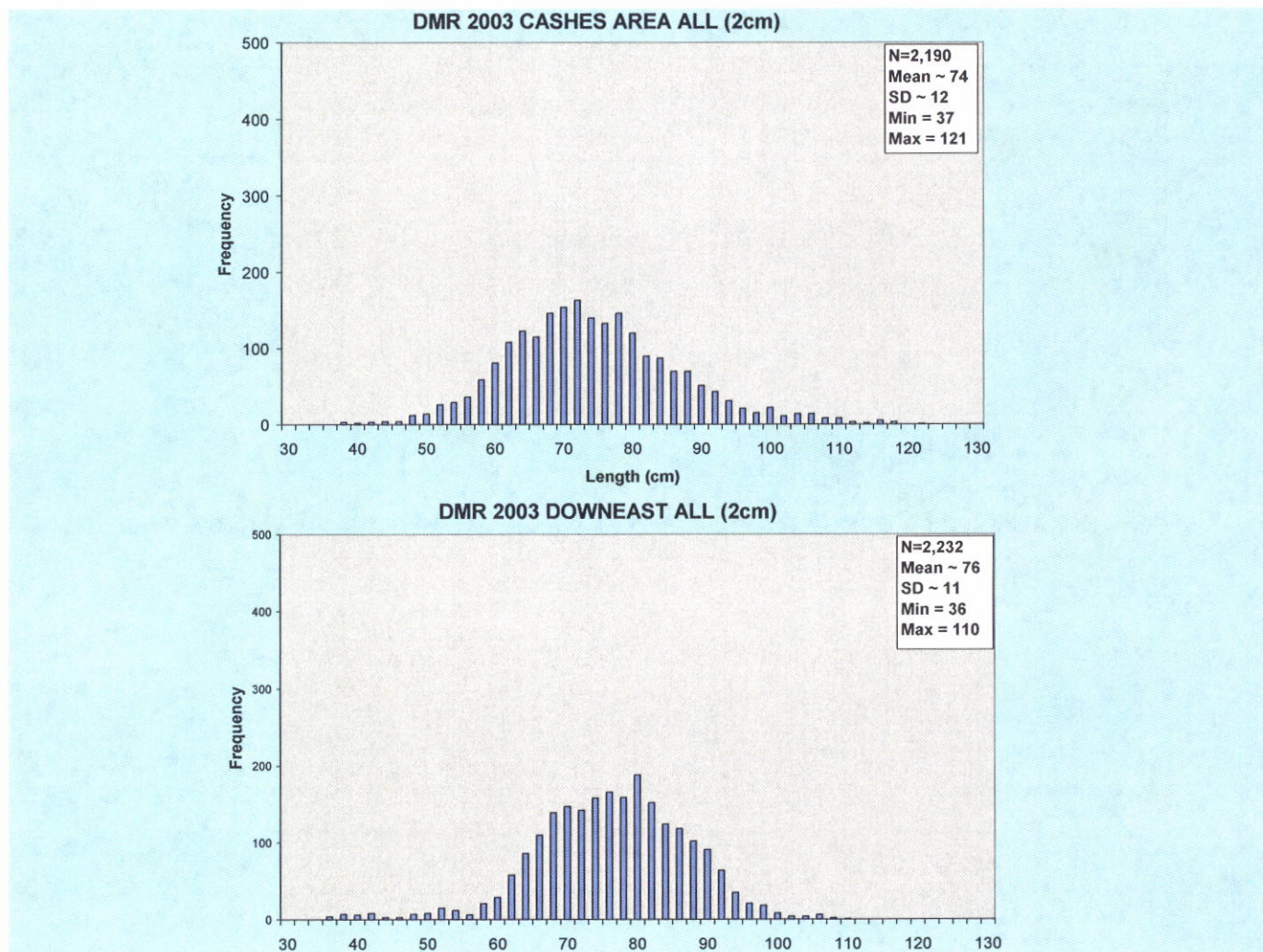


Figure 5. Length frequency of cod tagged and released by DMR in 2003, Cashes Ledge area vs. Downeast.

DMR 2004 trips (2cm)

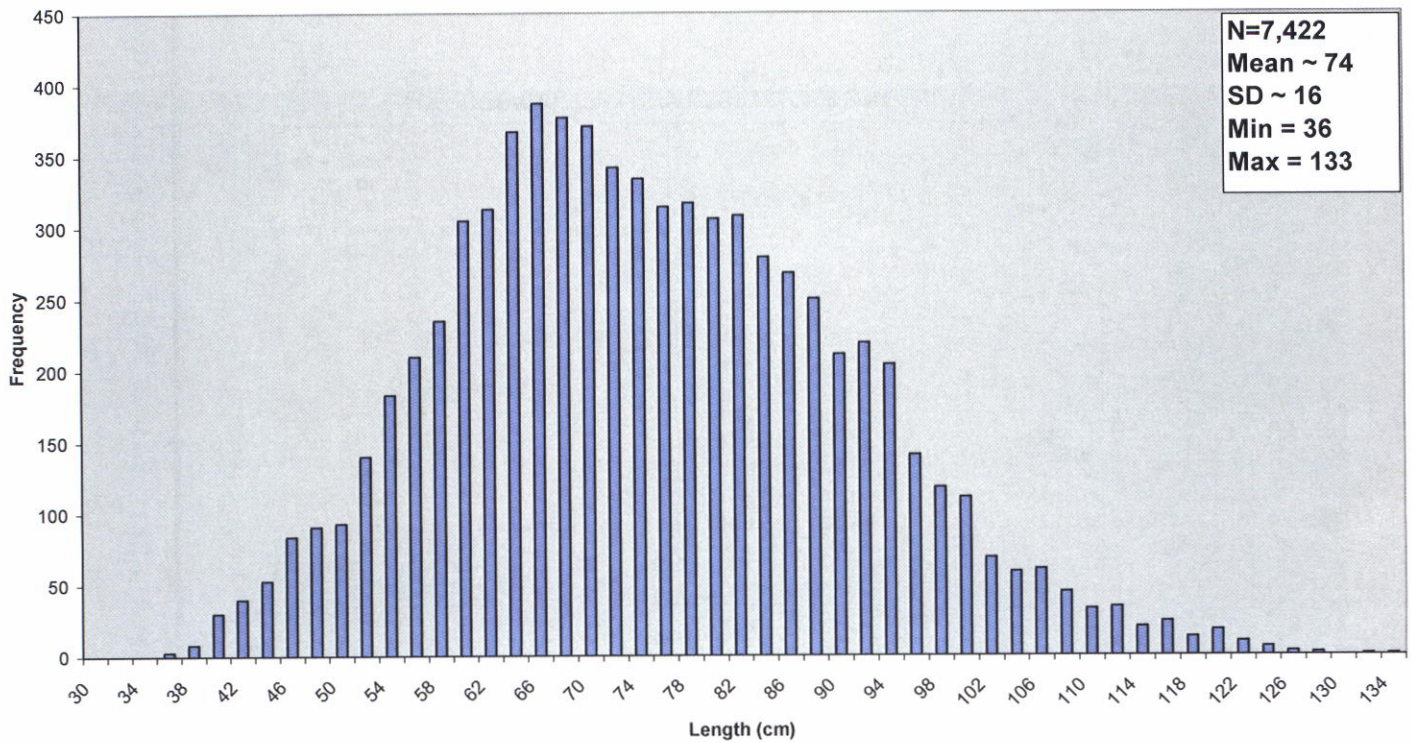
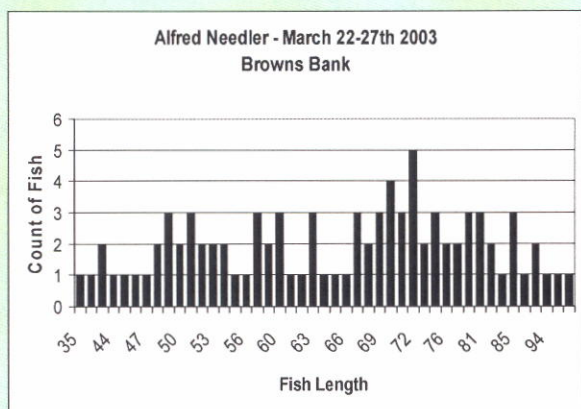


Figure 6. Length frequency of cod tagged and released by DMR, 2004.



September-October Grand Manan

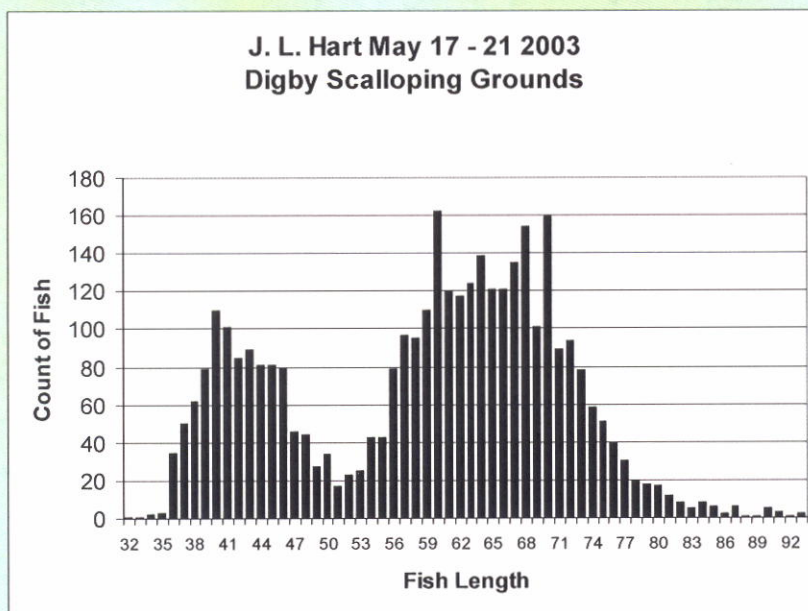
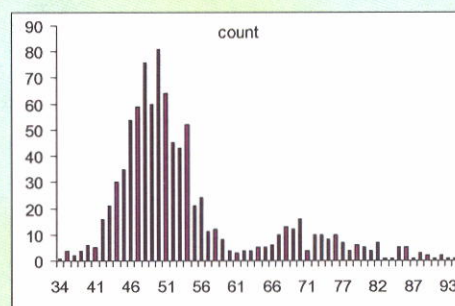


Figure 7. Length frequency of cod tagged and released by DFO, 2003.

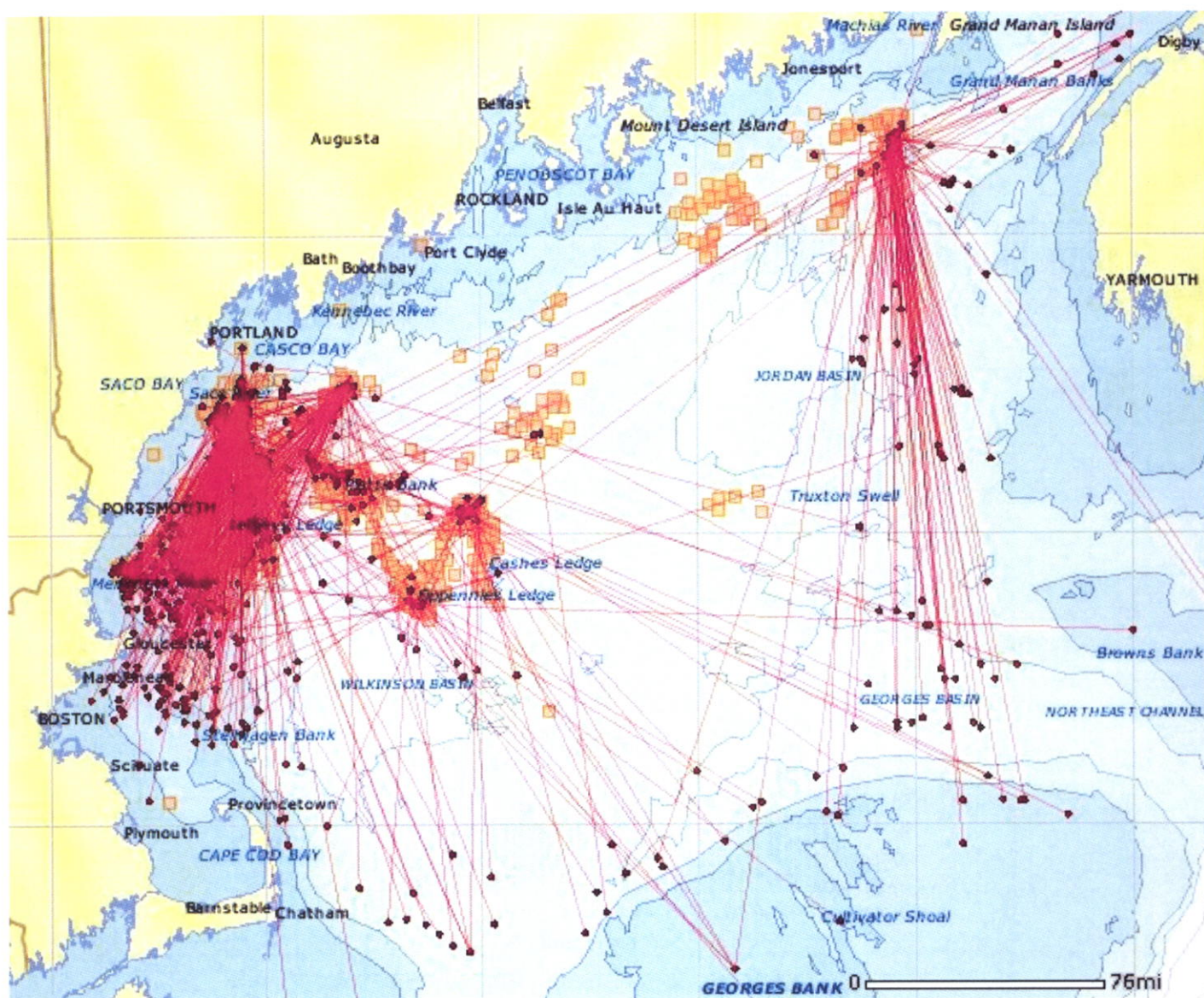


Figure 8. Locations of DMR tagged cod releases (yellow squares) and recaptures (red dots), as of 09/22/05 (screen capture from <http://www.gmamapping.org/codmapping/>).

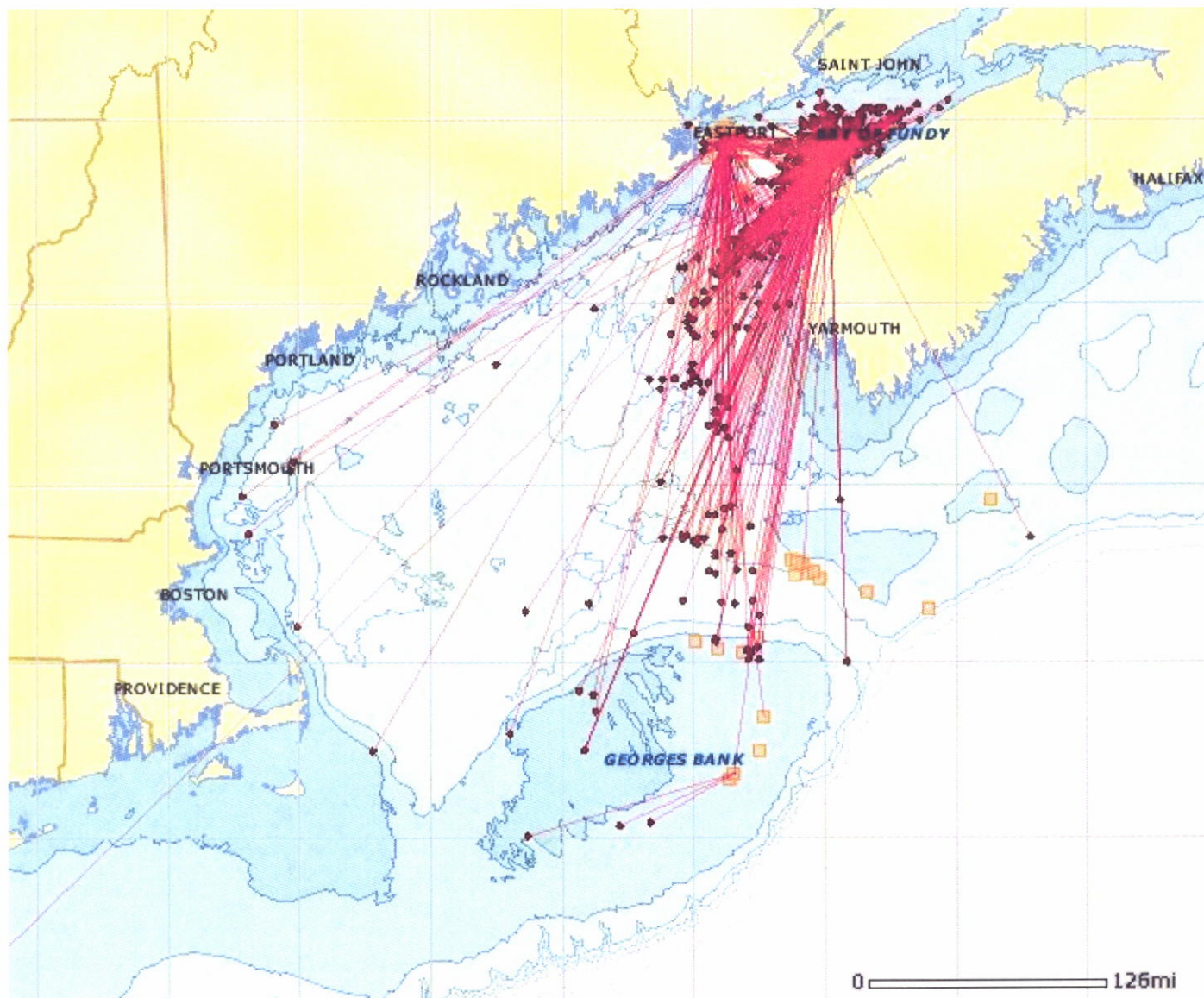


Figure 9. Locations of DFO tagged cod releases (yellow squares) and recaptures (red dots), as of 09/22/05 (screen capture from <http://www.gmamapping.org/codmapping/>).

APPENDICES

**Text of article in *Coastal Conservation Association (Maine)* newsletter
(August 2003):**

A major initiative is underway aimed at investigating movement and growth of Atlantic cod throughout the northeastern U.S. and the Scotia-Fundy region of Canada. The Northeast Regional Cod Tagging Program is in the first year of a two year study involving a combination of commercial and recreational fishermen and private, non-profit and governmental agencies. At least 100,000 cod will be tagged in this project, which is being carried out in Gulf of Maine, Georges Bank, southern New England and Canadian Maritime waters. The Maine Department of Marine Resources (DMR) is tagging cod at several areas in the Gulf of Maine as part of this venture.

Commercial and recreational fishermen are asked to be on the lookout for tagged cod. The tags are yellow and spaghetti-like in appearance and are located near the dorsal fin. Fishermen will receive a reward (hat, T-shirt or mug) and will be entered into a cash lottery for reporting tags and providing the following information: tag number, fish length, and date and location caught. The toll free number for reporting tagged cod is 1-866-447-2111. The toll free number is also printed on the tag, along with the words "NE COD TAGGING PROGRAM".

This study is expected to provide important new information on movement and migration, and will help to determine how much interaction exists between inshore and offshore areas. We also hope to determine whether distribution, movement and migration have changed over the years.

Text of announcement broadcast over National Weather Service (Gray, ME) marine weather radio:

Commercial and recreational fishermen are asked to be on the lookout for tagged cod. The Northeast Regional Cod Tagging Program is investigating movement and growth patterns of cod throughout the northeast. The tags are yellow and spaghetti-like in appearance and are located near the dorsal fin. Fishermen will receive a reward and will be entered into a lottery for reporting tags and providing the following information: tag number, fish length, and date and location caught. The toll free number for reporting tagged cod is 1-866-447-2111. The toll free number is also printed on the tag.

OUTDOORS

SALT WATER FISHING

You're it: Tag program needs help from recreational anglers

By BRUCE JOULE

As we move into fall, many anglers will head offshore, either in their own boats or aboard one of Maine's party or charter boats, to take advantage of some great groundfishing opportunities. If you spend any amount of time targeting cod, there is a good chance that you will hook up a tagged fish.

This past summer a cod-tagging program was initiated by the Maine Department of Marine Resources, the Canadian Department of Fisheries and Oceans, the Island Institute, the Gulf of Maine Research Institute, the University of Massachusetts School of Marine Science and Technology and the Cape Cod Commercial Hook Fishermen's Association. The purpose of this venture, better known as the Northeast Regional Cod Tagging Program, is to look at shifts in cod distributions, migration patterns and growth. In other words, where do the cod come from and where do they go?

During the past several months more than 7,000 cod measuring between 14 and 40 inches long were tagged and released throughout the Gulf of Maine.

The success of this program depends largely on help from the recreational angler. When you land a cod, please check for a yellow spaghetti tag located at the first dorsal fin in the middle of the back. The text on these tags reads: "NE COD



Photo courtesy of Eric Dandoy
Ted Golbiewski holds the 32.3-pound striped that earned him a first-place win in the 5th annual MDA & ERA Agency 1 Sport Fishing Tournament. At right: The Mitchells were also big winners when it came to stripers, with Cynde and Rod Mitchell placing in the adult category and Daniel and Annelia Mitchell placing in the youth category. The tournament took place Aug. 15-17.



Photo courtesy of the Department of Marine Resources

Tourney updates

A total of 125 anglers registered for the 5th annual MDA & ERA Agency 1 Sport Fishing Tournament on Aug. 15-17. This tournament, the last for 2003, was based out of the Spring Point Marina in South Portland. This year's big winners were:

Bluefish: 1st, Wayne Mallman, 13.9 pounds; 2nd, Peter Whelan, 12.7 pounds; 3rd, Richie White, 12.5 pounds.

Junior Category: 1st, Kurissa Guay, 10.6 pounds; 2nd, Andrew Yata, 10.3 pounds; 3rd, Steven Bowler, 9.4 pounds.

Striped Bass: 1st, Ted Golbiewski, 32.3 pounds; 2nd, Cynde Mitchell, 27.6 pounds; 3rd, Rod Mitchell, 27.6 pounds.

Junior Category: 1st, Daniel Mitchell, 23.6 pounds; 2nd, Annelia Mitchell, 23.1 pounds; 3rd, Annelia Mitchell, 7.4 pounds.

Groundfish: 1st, Carol Morse, 37.8 pounds; 2nd, Greg Morse, 36.3 pounds; 3rd, Carol Morse, 31.6 pounds.

Mackerel: 1st, Elizabeth Yata, 2.0 pounds; 2nd, Daniel Mitchell, 1.9 pounds.

This saltwater report is compiled by Bruce Jole, Maine Department of Marine Resources, P.O. Box 8, West Boothbay Harbor 04575. If you have information to report please contact him at 632-9605 or e-mail: Bruce.Jole@dmr.maine.gov

Regional Cod Tagging Program toll-free at 1-866-447-2111 or by e-mailing codresearch@jma.org.

Each tag return earns the angler a choice of a hat, T-shirt or mug. As an added bonus, those who provide com-

plete tag information will be entered into a monthly lottery.

For more information, call the toll-free number above or visit the cod tagging program's Web site, www.codresearch.org.

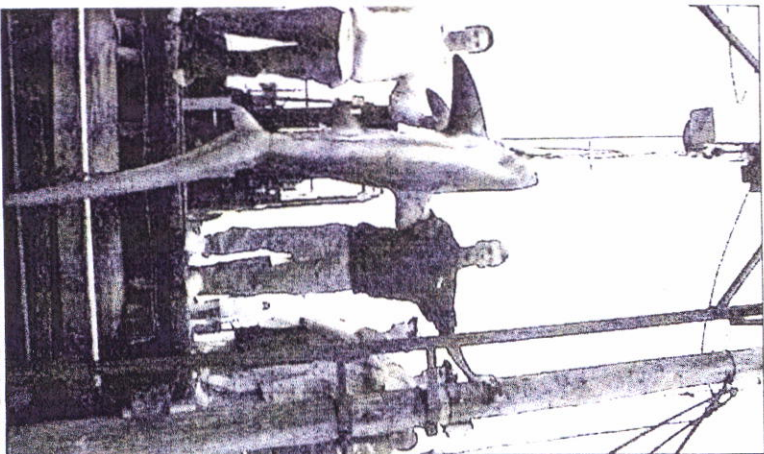
If you catch a sub-legal fish or a legal fish you plan to release alive, do not remove the tag. Just collect the information and send it in.

You can pass along this valuable information by calling the Northeast

OUTDOORS

SALTWATER FISHING: BRUCE JOULE

Take time to report tagged cod, sharks



Courtesy of Maine Department of Marine Resources
in and crew take first place at the 2004 Bailey
ament with this 178.2-pound thrasher shark.

Today I would like take the opportunity to discuss two tagging programs geared for the offshore fisherman. One program is designed to find tagged cod, while anglers in the other program actively tag sharks.

If you spend any amount of time targeting - and catching - cod there is a good chance that you will hook a tagged fish. In 2003, a cod-tagging program was initiated by the Maine Department of Marine Resources, the Canadian Department of Fisheries and Oceans, the Island Institute, the Gulf of Maine Research Institute, the University of Massachusetts School of Marine Science and Technology and the Cape Cod Commercial Hook Fishermen's Association.

This purpose of this venture, better known as the Northeast Regional Cod Tagging Program, is to look at shifts in cod distribution, migration and growth patterns. In other words, where do the cod come from and where do they go? Since the program's inception, more than 130,000 fish have been tagged between Block

Island and the Bay of Fundy, including 24,000 cod in the Gulf of Maine.

The success of this program depends largely on help provided by you, the recreational angler. When you land a cod, please check for a yellow spaghetti tag that would be located at the first dorsal fin (in the middle of the back). The text on these tags reads: "NE COD TAGGING PROGRAM" followed by a tag number and phone number. If you do catch a tagged cod please collect the following information:

- 1. Tag number
- 2. Date
- 3. Location
- 4. Total length of fish
- 5. Water temperature
- 6. Depth fished
- 7. Spawning condition

If you land a sub-legal fish or a fish you plan to release alive, do not remove the tag from the fish, just collect the above information and send it in.

You can pass along this valuable information by contacting the Northeast Regional Cod Tag-

ging Program toll-free at 1-866-447-2111, or by e-mail at codresearch@gnrt.org. For your efforts, each tag return earns the angler a choice of a hat, T-shirt or mug. As an added bonus, those of you who provide complete tag information will be entered into a monthly lottery. In addition, if you come up with a blue tag, you may be eligible for \$100. If you have any questions or want more information about this program, call the phone number above, or visit www.codresearch.org/index.htm.

The next program is actively recruiting shark fishermen. The National Marine Fisheries Service Apex Predators Program's mission is to conduct life history studies of commercially and recreationally important shark species. Research is focused on distribution and migration patterns, age and growth, reproductive biology and feeding ecology. A component of the APP is the Cooperative Shark Tagging Program. If you think you might want to participate in this tagging program, go online to

na.nmfs.noaa.gov/sharks/, or call Lisa at 401-782-3320.

Thrasher fishermen, the APP needs your help. Specifically, if you land a thrasher, please obtain a measured fork length (tip of the nose to the fork in the tail), remove a 6-inch to 10-inch piece of the backbone, freeze it and call Lisa at the above number. If you catch a tagged thrasher, please record fork length. After which, record tag number and recapture details (date, location, lat and long or lozan, sex and method of capture). Then remove a 6-inch to 10-inch piece of the backbone from over the gills, freeze it and call the above number collect for postage paid mailers.

Recreational anglers can be a valuable asset to fisheries biologists, furthering our knowledge of how and why fish behave as they do.

This saltwater report is by Bruce Joule, Maine Department of Marine Resources, P. Box 8, West Boothbay Harbor, 04575. If you have information to report or have questions, contact him at 633-9505 or bruce.joule@maine.gov

